

I. *ASTROPECTEN? MONTANUS*—A NEW STAR-FISH
FROM THE FORT BENTON; AND SOME
GEOLOGICAL NOTES.

BY EARL DOUGLASS.

In October, 1901, after finishing my collecting work for the Princeton Museum in the region of the Musselshell River in Montana, my father and myself started westward with team and camping outfit to reëxamine the Miocene deposits in the vicinity of Three Forks. We followed the Musselshell River to the source of its southern fork and passed over the divide into the valley of the South Fork of Smith River. Here, near Dorsey Station, the cream-colored nodular clays of the Deep River beds form quite high benches, while the lower benches and sage-brush flats are composed of softer material of lighter color. The latter look like the Lower White River beds as seen in other portions of western Montana; and, though no fossils were found, there is little doubt that the beds belong to this horizon. I do not think that the occurrence of White River beds has previously been noted in the Smith River valley.

From here we went southwestward, passing down the rugged, picturesque cañon of Sixteen Mile Creek. Here the Carboniferous limestones form huge walls, high pinnacles, and rugged masses, which are irregularly stained with red, giving them a fantastic appearance. The Madison division contains some fossils, as it does in nearly every place where it is exposed; though the fossils are not so abundant here as in some localities.

South of the main stream of Sixteen Mile Creek, in the foot-hills at the north end of the Bridger Range, about twenty-five miles north of Bozeman, we stopped at the house of Mr. Urquhart. Ascending a ridge composed principally of igneous material just east of the house, we found, near the top, a layer of hard, compact, gray, iron-stained rock, crowded with fossil leaves. This probably belongs to the Livingston formation.

We remained about three days in order to examine the cañon of the South Fork of Sixteen Mile Creek where Mr. Urquhart and his sons had found many fossils.

The fossils occur in dark shales and sandstones, the latter being sometimes very hard. We obtained remains of mollusca, a crustacean, and fish scales. The shells prove that the rocks belong to the Fort Benton group. The crustacean is *Linuparus canadensis*. The new star fish which is described in this paper was found by Mr. William Urquhart several years ago in these Benton beds. He showed me the place where he found it, and the matrix is like the Benton calcareous sandstone at this place; so his remembrance of the locality of its discovery is confirmed. The strata dip at a high angle. The locality is near the intersection of the 46th parallel and the 111th meridian and is about twenty-three miles nearly due north of Bozeman.

LINUPARUS CANADENSIS (Whiteaves).

Hoploparia canadensis Whiteaves, Contrib. Canad. Pal., Vol. I., Part I., 1885, p. 87, Pl. 11.

(Locality: Highwood River, a tributary of the Bow River.) Ten miles west of the first fork. Probably Fort Benton (p. 89).

Linuparus atavius Ortmann, Amer. Jour. Sci., Vol. 4, 1897, p. 290; fig. 1-3 (Niobrara?) Head of Cottonwood Creek, Mead Co., S. Dakota.

There are several specimens of different sizes indicating difference in age—three carapaces, one antennal region, one abdomen well preserved. All agree with this species in every detail except in size. Only one specimen attains the dimensions of the smallest specimen described by Ortmann.

The Dakota specimen was obtained from Mr. H. F. Wells. The horizon is somewhat doubtful, though he thought it to be Niobrara. There is some doubt also concerning the Canada specimens.

ASTROPECTEN? MONTANUS, sp. nov.

The type consists of an impression in the hard calcareous sandstone. Since it is only an impression its anatomical characters can only partially be made out.

Size small; arms five, narrow and gradually tapering, longer than diameter of body; five radial elliptical figures on body, all except one nearly in line with the long axis of the arms. The most prominent markings are the pits which probably represent the marginal plates. It is possible however that these may be impressions of the ambulacra. Half way from the base to the end of the arm each row of pits is nearly

as wide as the middle portion of the arm. Only one arm is complete. This has twelve pits on each side and they are opposite. From the central pit to end of perfect arm 12 mm. From central pit to margin of body between the arms 3.5 mm.

It was said by those who saw it when first obtained to have possessed little markings on the margins of the arms. The rock was used for years as a step near the door and if these were present they have been wholly worn away.

The rock is a hard, fine-grained calcareous sandstone, greenish-gray in color and weathering to brown on the surface.

Below are given determinations of the accompanying fossils and notes which were both kindly furnished by Dr. A. E. Ortmann. They are of interest as determining the horizon of the beds and showing the fauna of the Fort Benton near the eastern portion of the mountain region, since much of the Cretaceous of this region has been found to be poor in fossils.

INOCERAMUS UNDABUNDUS Meek and Hayden (?).

Stanton, Bull. U. S. Geol. Surv., 106, 1893, p. 84, pl. 6, figs. 1, 2.
(Fort Benton. Upper Missouri Region.)

Five casts; smaller than type, but outline and character of sculpture similar; the undulations, however, are a little more crowded, which may be due to the younger age of our specimens.

PINNA LAKESI White (?).

White, 12th Ann. Rep. U. S. Geol. and Geog. Surv. of Terr., Part I., 1883, p. 17, pl. 11, fig. 1.

Ridge sixteen miles west of Greeley, Colorado. (Fort Pierre.)

Reported from South Fork of Old Man River, Canada, by Whitcaves. Contrib. Can. Pal., Vol. I., part 1, 1885, p. 84. Apparently Fort Benton (p. 89).

One fragment compared with the type agrees well, but is smaller and more compressed, sculpture identical.

PHOLADOMYA PAPYRACEA Meek & Hayden (?).

Stanton, Bull. U. S. Geol. Surv., 106, p. 116, pl. 26, p. 1.

Fort Benton group. Upper Missouri region.

Three specimens (both valves).



FIG. 1. *Astropecten? montanus* Douglass. (No. 601.)
Natural size.

The identification remains doubtful. Our individuals correspond to this species in sculpture, but they are longer and thicker. Stanton mentions specimens from Montana that are much larger than the type.

SCHLOENBACHIA SHOSHONENSIS (Meek).

Mortoniceras shoshonensis Meek, Rep. U. S. Geol. Surv. Terr., Vol. 9, 1876, p. 449, pl. 6, figs. 3 and 6.

Stanton, Bull. U. S. Geol. Surv., 106, 1893, p. 179, pl. 44, figs. 1 and 2.

Fort Benton, of Wyoming.

One fragment hardly larger than the one figured by Meek, but evidently the same character of sculpture.

SCAPHITES VENTRICOSUS Meek & Hayden.

U. S. Geol. Surv. Terr., Vol. 9, 1876, p. 425, pl. 6, figs. 7 and 8.

Stanton, Bull. U. S. Geol. Surv., 106, 1893, p. 186, pl. 44, figs. 8-10, pl. 45. (Fort Benton of Upper Missouri region.)

One complete individual of about the size of that figured by Stanton in pl. 44, fig. 10, and agreeing with it exactly in the external characters (sculpture).

Indeterminable casts of bivalves, *Ostrea*? *Exogyra*, *Cucullæa*, and gasteropods (*Turritella*?).

NOTE. The specimens above described are in the Princeton collection with the exception of *Astropecten* ? *montanus* which is in the Carnegie Museum.

CARNEGIE MUSEUM,

October 6, 1902.